REMARKS

Responsive to the Final Office Action dated March 29, 2004, Applicants hereby make the following response. Claims 1, 4, 6, 8-9 and 14-26 are pending in the above-referenced application. In this Amendment, Applicant has cancelled Claims 5-7, 10-13 and 20 and has amended Claims 1, 4, 8, 9, 19, 21 and 22. Accordingly, Claims 1, 4, 8, 9, and 14-26 remain pending for prosecution.

I. Summary of the Claims

The present invention is concerned with a non-aqueous electrolyte secondary cell. Traditional lead-acid cell and nickel-cadmium cells have low discharge voltage, low energy density, and more self-discharge than lithium-based secondary cells. Lithium-based secondary cells also show excellent cycle characteristics. These secondary cells may be used as an operating power supply for portable electronic devices which are often used for long periods of time. Moreover, lithium-based secondary cells may also function as a power supply for small electronic devices that require long-period charge/discharge cycle characteristics. However, prior art lithium-based secondary cells are typically limited in usability for long periods of time and are sensitive to storage environment conditions, particularly high temperature environments. The present invention therefore discloses a non-aqueous electrolyte secondary cell using $Li_xFe_yPO_4$, wherein $0 < x \leq 2$ and $1 \leq y \leq 2$. The secondary cell of the present invention provides a high capacity power supply and exhibits superior storage characteristics even when stored in a high temperature environment for long periods of time.

Independent Claim 1, as amended, recites a non-aqueous electrolyte secondary cell including a cathode wherein the cathode includes $Li_xFe_yPO_4$ having a particle diameter not greater than 10 micrometers and wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. An anode is also provided wherein the anode includes sintered carbon material prepared by sintering a carbon material

capable of doping/dedoping lithium. Finally, the secondary cell includes a non-aqueous electrolyte solution.

Independent Claim 4, as amended, recites a non-aqueous electrolyte secondary cell including a cathode having a molded body wherein the cathode is composed of a cathode active material and a conductive agent. The active material includes $Li_xFe_yPO_4$ which has a particle diameter not greater than 10 micrometers and wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. The secondary cell also includes an anode having a molded body wherein the anode includes a material selected from the group consisting of an anode active material capable of doping/dedoping lithium, a conductive agent, and mixtures thereof. The secondary cell also includes a non-aqueous electrolyte solution.

II. Claim Objections

Claim 1 was objected to because of an informality. The extraneous "a" has been removed. Claim 12 has been canceled. Accordingly, Applicant respectfully requests withdrawal of the objections.

III. Double Patenting

Claims 10-13 was cancelled. Therefore no double patenting issue remains.

IV. The § 112 Rejections

Claims 4-13 and 19-26 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with written description requirements. In particular, it was asserted that Claims 4, 5, 7, 10 and 12 recite "$0 \leq x \leq 2$" but that $x = 0$ was not supported by the specification as filed. Applicant has amended Claim 4 to recite "$1 < x \leq 2$" which is supported by the specification and has cancelled Claims 5, 7, 10 and 12. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 10-13 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with written description requirements. In particular, it was asserted that the claims recite "average particle diameter" which is not supported by the specification as filed. Applicant has cancelled Claims 10-13 thereby rendering this rejection. Accordingly, Applicant respectfully requests withdrawal of this rejection.

Claims 4-26 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant addresses each claim rejection as follows:

Claim 4 has been amended to more clearly set forth that the anode comprises an active material and a conductive agent.

Claim 5 has been canceled.

Claim 6 has been canceled.

Claims 7 and 10 have been canceled.

Claim 12 has been canceled.

Claim 19 has been amended to more clearly set forth that it is the anode active material being described.

Claims 20-22: It was asserted that the specification describes the materials of Claims 20-22 as an active material for the anode. However, Applicant respectfully submits that the specification describes the anode active material as a carbon material (see p. 6, lines 15-20) and goes on to describe the conductive agent that may be used in combination with the active material or alone (see p. 6, line 21 - p. 7, line 11). Since it is the anode active material that must be capable of doping/dedoping lithium as more clearly set forth in the current amendment to Claim 4, the materials of claims 20-22 do not need to fulfill this function. Applicant has therefore canceled Claim 20 and has amended Claims 4 and 21-22 to more clearly define the

anode active material and the anode conductive agent. These amendments also overcome the other reasons for rejection under § 112, second paragraph, set forth in the Office Action.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 112 rejections.

V. The § 102(b) Rejection

Claims 4, 6, 19-21 and 23-26 were rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent No. 09-171827 to Koichiro. For the following reasons, Applicant respectfully submits that the present invention is not anticipated under § 102(b) and requests reconsideration and withdrawal of this rejection.

Claims 4, 6, 19-21 and 23-26 are not anticipated by the cited reference because Koichiro fails to teach each and every limitation of these claims. Specifically, Koichiro fails to teach a cathode active material represented by $Li_xFe_2PO_4$ wherein $1 < x \leq 2$. Moreover, Koichiro fails to teach such active material having a particle diameter of less than 10 micrometers.

Thus, because Koichiro fails to disclose every limitation of independent Claims 4, it does not anticipate this claim and the claims depending therefrom and cannot therefore cannot be used to support a rejection under § 102(b). Applicant therefore respectfully requests that this rejection be withdrawn.

VI. The § 103(a) Rejection

Claims 1 and 4-26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,705,296 to Kamauchi et al. in view of U.S. Patent No. 6,576,369 to Moriguchi et al. and further in view of U.S. Patent No. 5,910,382 to Goodenough et al.. In particular, it is asserted that the present invention would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to use the $LiFePO_4$ positive active material of Goodenough for the $LiCoPO_4$ positive active material of

Kamauchi because Goodenough teaches both positive active materials are known for use in lithium secondary batters. Furthermore, it is asserted that Kamauchi clearly at least suggests the $LiFePO_4$ positive active material compound and that Kamauchi teaches transition metals besides cobalt such as Ni, Fe, Mn, Cr and V may be contained in the lithium-phosphate positive active material. For the following reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Kamauchi does not teach or suggest the claimed invention. As stated in the Office Action, Kamauchi does not teach a negative electrode comprising a sintered carbon material as claimed in Claim 1. Further, there is no teaching or suggestion of a non-aqueous electrolyte secondary cell wherein the positive electrode is comprised of lithium iron phosphate. As stated in the first paragraph of the Detailed Description of the Preferred Embodiment, the Kamauchi invention "provides a positive electrode active material to be used for a lithium secondary battery, which comprises at least one compound selected from the group consisting of lithium phosphate, lithium-cobalt phosphate, cobalt oxide, and lithium-cobalt oxide so as to contain cobalt at a concentration of more than 0.1 mole, and phosphorus at a concentration of more than .2 mole both with respect to 1 mole of lithium." *Column 3, lines 28-36.* The Office Action, at

page 9, states that "Kamauchi does not require any specific ratio of cobalt:phosphorus:lithium." Applicant respectfully traverses this assertion. Throughout the Kamauchi disclosure and claims, this ratio is required and is, in fact, one of the points of novelty of the Kamauchi invention. Use of $Li_xFe_yPO_4$ as the active material would not fulfill Kamauchi's requirement that the active material have a molar ratio of cobalt:phophorus:lithium equal to more than 0.1:more than 0.2:1. Kamauchi therefore teaches away from the present invention.

Furthermore, there is no disclosure of the use of iron in any of the Examples nor is there any disclosure of the use or resulting product of $LiFePO_4$. It is asserted in the Office Action that Kamauchi does have a specific example wherein the positive electrode active material is lithium iron phosphate. Applicant respectfully traverses that assertion. There is no reference to $Li_xFe_yPO_4$ in any form in the Kamauchi disclosure. The only reference to iron in the entire Kamauchi references is at Column 4, lines 42-44 which read as follows: "*In addition* to these four members, transition metals-besides cobalt, such as Ni, Fe, Mn, Cr and V may be contained on demand." The four members referred to are cobalt oxide, lithium phosphate, lithium-cobalt phosphate and lithium-cobalt oxide. The addition does not, however, occur in the form of lithium iron phosphate or result in the same. As shown in Comparative Example 2, Example 4, Comparative Example 3, Examples 5,6, when the transition metals nickel and tin were added, they were added as basic nickel carbonate and tin (IV) oxide and resulted in a product with an $LiCoO_2$ phase. Applicant therefore submits that there is no teaching or suggestion in Kamauchi to provide a positive electrode having an active material composed of $Li_xFe_yPO_4$ wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. Moreover, there is no teaching or suggestion in Kamauchi that the $Li_xFe_yPO_4$ active material have a particle diameter of less than 10 micrometers.

Similarly, Moriguchi fails to teach or suggest the claimed invention. Moriguchi merely discloses a lithium secondary battery having an anode comprising a graphite material.

Moriguchi does not teach or suggest the use of $Li_xFe_yPO_4$ as a cathode active material in conjunction with an anode active material capable of doping/dedoping lithium and a non-aqueous electrolyte solution. In fact, Moriguchi teaches away from the present invention. Moriguchi only discloses lithium-containing transition metal oxides as the positive electrode active material. There is no disclosure of or suggestion to use a phosphate as an active material. Applicant therefore submits that there is no teaching or suggestion in Moriguchi to provide a positive electrode having an active material composed of $Li_xFe_yPO_4$ wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. Moreover, there is no teaching or suggestion in Moriguchi that the $Li_xFe_yPO_4$ active material have a particle diameter of less than 10 micrometers.

Finally, Goodenough also fails to teach or suggest the claimed invention. Goodenough teaches an active material containing $LiMPO_4$ wherein M is preferably Mn, Fe, Co, Ti, Ni or a combination thereof. Goodenough does not, however, teach or suggest a cathode active material including $Li_xFe_yPO_4$ wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. Moreover, there is no teaching or suggestion in Goodenough that the $Li_xFe_yPO_4$ active material have a particle diameter of less than 10 micrometers.

Further, it is asserted in the Office Action that one of ordinary skill would have been motivated to use the LiFePO4 active material of Goodenough for the LiCoPO4 active material of Kamauchi because Goodenough teaches both positive active materials are known for use in lithium secondary batteries. However, as discussed above, the use of LiFePO4 as the positive electrode active material is contrary to the teachings of Kamauchi. Therefore, one of ordinary skill would not have been motivated to substitute the active material of Goodenough for the active material of Kamauchi.

As discussed above, neither Kamauchi nor Moriguchi teach or suggest the use of $Li_xFe_yPO_4$ having a particle diameter of less than 10 micrometers wherein $1 < x \leq 2$ and $1 \leq y \leq$

2 as a cathode active material. Goodenough also fails to teach these elements of Applicant's claims. Therefore, there is no reasonable expectation of success in achieving the invention as claimed when the cited references are modified or combined. As discussed above, none of the cited references contain all the elements of Applicants' independent claims 1 and 4. Unless all the elements are taught by the references, there can be no success in modifying them.

Thus, at the time the present invention was made, none of the references cited teach or describe *all* of the limitations claimed by Applicant in independent claims 1 and 4 and the claims depending therefrom. It would therefore not have been obvious to one of ordinary skill in the art to provide a cathode active material comprising an active material including $Li_xFe_yPO_4$ having a particle diameter of less than 10 micrometers wherein $1 < x \leq 2$ and $1 \leq y \leq 2$. Accordingly, independent claims 1 and 4 and the claims depending therefrom are nonobvious under § 103 (a).

VII. Conclusion

Accordingly, Applicant respectfully submits that the present application is now in condition for allowance and courteously solicits the same. If the Examiner should have any questions regarding the foregoing, she is encouraged to call the undersigned at 816.460.2516. Should any fees be necessitated by this response, the Commissioner is hereby authorized to deduct any such fees from Deposit Account No. 19-3140.

Respectfully submitted,
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